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XIX.—*On the Penæidea.* By C. SPENCE BATE, F.R.S. &c.

(A Critical Examination of the typical Specimens of the Penæidæ of Milne-Edwards, preserved in the Museum of the Jardin des Plantes, and a Synopsis of the Species of Penæidea in the 'Challenger' Collection.)

[Plates XI. & XII.]

IN the collection of Crustacea brought home by the 'Challenger' there is a very considerable number of species of *Penæus* and nearly allied genera. Believing these to constitute one of the most distinct and natural groups of the class, I have endeavoured carefully to determine the various forms that distinguish the genera and species of the extremely interesting tribe Penæidea.

The tribe itself differs from all others of the class in the structure of the branchiæ, in having the third pair of pereopoda chelate and in most genera the anterior two pairs also, with long carpi and subequally chelate hands; but the posterior two are never chelate.

The sexual characters of both male and female are peculiar. The first pair of pleopoda is single-branched, the base carrying on each side in the former a large curtain-like membrane that is attached by a small pedicle near the base of the first joint and meets its fellow at the centre, where they are united by a number

of small hook-like processes that Sars has called "*cincinnuli*;" this membrane (which I propose to call "*petasma*," from its curtain-like character), when at rest, lies folded up in a manner peculiar to each separate species.

The second pair of pleopoda, like all the others posterior to it, is two-branched, besides which there is in the male a rudimentary branch attached to it that varies much in different species, which variations, without being very important, are yet valuable addenda for the determination of closely approximating forms. The other pleopoda gradually decrease in length posteriorly.

In the female the vulvæ are situated at the extremity of open projections on the third (that is, the posterior of the chelate) pair of pereopoda; and, in most instances, in the family *Penæidæ* the organs face each other and almost touch in the median line. Posterior to these a ventral plate of varying form and appearance, according to species, lies between the last two pairs of legs; connected with this, varying also in form with species, a large mass of brown membranous material is attached: in some species large and fan-like in shape, in others it is an irregular oval disk; but what relation it has to the true history of the animal, observation has yet to determine.

The first pair of pleopoda, as in the male, is single-branched, and the *petasma* is reduced to a rudimentary process; and the second pair of pleopoda does not carry a small additional branch. Add to this the singular fact that among all the specimens in the 'Challenger' collection, as well as those in the British Museum and the typical collection of the Jardin des Plantes, there is not a single specimen in which the female has either ova or the remains of ovisacs attached to the hairs of the pleopoda—a circumstance which, compared with the great frequency with which ova in all stages are found in nearly every genus of the class besides, is highly suggestive, either that the *Penæidea* are viviparous, or that the young like those of some fish, are hatched floating in the sea.

What form the *Brephalus* may take is yet to be determined: it may be what Fritz Müller has pronounced it to be; but whether it be a *Nauplius*, a *Zoëa*, or a *Megalopa* must be decided by future observation.

After comparing the specimens in my possession with the descriptions in the works of the best-known carcinologists, such as Milne-Edwards, De Haan, Dana, Stimpson, Heller, &c., I examined the collection in the British Museum, under the care of Mr. Miers, who has recently drawn up a "synoptic table of the species of *Penæus*," which was published in

the 'Proceedings of the Zoological Society of London,' March 5, 1878. I came to the conclusion that it was desirable to see the typical specimens on which Prof. Milne-Edwards determined the forms that he published originally in his 'Histoire Naturelle des Crustacés,' vol. ii. pp. 403-430.

In the collection of the Jardin des Plantes, with the cooperation and assistance of Prof. Alphonse Milne-Edwards, I was enabled to identify all the old types still preserved in the Museum except *Penæus styliferus*, which, I fear, has got mingled with others or the label lost in the hasty removal of the specimens to some underground cellars during the unhappy period of the Communistic ascendancy in Paris.

It is at the suggestion of Prof. A. Milne-Edwards that this memoir is written; and my intention is to adhere as nearly as possible to the text of the 'Histoire des Crustacés,' making such further additions as appear to me to be necessary for the ready identification of the species, together with figures of such as have not already been published of the typical forms.

The tribe *Penæidea* contains several genera; but of those tabulated in the 'Histoire des Crustacés' certainly *Stenopus*, *Oplophorus*, *Ephyrus*, and *Pasiphæa* must be excluded.

SICYONIIDÆ.

Sicyonia, Edw. Branchiæ dendrobranchiate, but arranged in plates. Scaphocerite angular.

PENÆIDÆ.

Penæus (Fabricius), in which the first pair of antennæ are shorter than the carapace.

Penæopsis (A. Milne-Edwards), in which they are longer.

Solenocera (Lucas), in which they are longer and have one of the rami flattened and concave longitudinally.

Haliporus, n. gen. Body more slender.

Hemipenæus, n. gen. Rostrum straight, short; five podobranchiæ present.

Aristeus, Duvernoy. Rostrum long; five podobranchiæ.

Hepomadus, n. gen. Damaged; four podobranchiæ.

Benthescymus, n. gen. Rostrum short and crest-like; five podobranchiæ.

Gennadas, n. gen. Like last, with less arborescent branchiæ.

Euphema, Edwards. Young Peneid.

SERGESTIDÆ.

Sergestes, Edw. First pair of pereopoda not chelate, second and third chelate, fourth and fifth not chelate.

Petalidium, n. gen. Four branchial plumes only, and four single foliaceous branchial plates.

Acetes, Edw. Like *Sergestes*; fourth and fifth pairs of pereopoda wanting.

EUCOPIIDÆ, Dana.

Eucopia, Dana. Gnathopoda developed as pereopoda; five anterior pairs subchelate; two posterior "vergiform."

Chalaraspis, Willemoes-Suhm. Like *Eucopia*, but has only the posterior pair non-chelate.

Sicyoniidæ, Edwards.

The genus *Sicyonia* has been clearly defined by M. Milne-Edwards, and illustrated by excellent figures of *S. sculptus* and *S. carinatus* in the 'Annales des Sciences Naturelles' for March 1830; but the general form of the animal and the texture of its external covering do not correspond with the character of *Penæus* in any single feature, except that the third pair of pereopoda is chelate. Added to this, the branchiæ differ considerably in structure also. Although the structure is dendrobranchiate in form, it varies typically from that seen in *Penæus* and allied genera by having the ultimate rami foliaceous (flat and scale-like) instead of being cylindrical.

These points (that is, the external appearance combined with the altered branchial condition), in my opinion, warrant the establishment of a distinct family for the true classification of the genus.

SICYONIA, Edw.

Sicyonia sculpta, Edw.

Inhabits the Mediterranean, Milne-Edwards's specimens having come from the Bay of Naples. That in the 'Challenger' collection was taken off St. Vincent, in the Cape-Verd Islands.

Sicyonia carinata, Olivier, Edw.

Is recorded by Milne-Edwards from the coast of Rio Janeiro.

The 'Challenger' specimens were taken in shallow water at St. Thomas's, in the West Indies.

Sicyonia lancifer, Olivier, Edw.

I have little doubt that this species is the same as *S. cristata* of De Haan ('Fauna Japonica,' p. 190, pl. xlv. fig. 10).

The 'Challenger' specimen is undoubtedly *S. cristata* of De Haan; but it agrees with Olivier's description of *S. lancifer* in all points, excepting that Olivier says that the latter has five or six teeth posterior to the line of the frontal margin, whereas in our specimen, as well as in De Haan's, there are properly only four. But when we consider how general were the descriptions given of animals a few years since, and even now by some writers, I think it highly probable that Olivier reckoned in the number behind the frontal margin the unusual and prominent tooth that projects anteriorly from the first somite of the pleon.

Olivier's specimen was procured from the Indian seas; although the habitat is omitted in the 'Histoire des Crustacés,' it is given by Edwards in a note to the species in the 'Annales des Sciences Naturelles.' De Haan's was from Japan; and the 'Challenger' took it south of New Guinea in about 28 fathoms of water.

Sicyonia lævis, n. sp.

Surface of the animal smooth. Rostrum armed with five teeth, dorsal carina with two. Hepatic tooth small. Pleon slightly carinated. Telson as long as the outer plates of the rhipidura.

This species can only be mistaken for *S. parvula* of De Haan, but differs from it in being more slender, in having the rostrum without a tooth on the lower margin, and in having the apex terminating in a slender bidentate point.

Length 1 inch.

Taken north of New Guinea, at a depth of 150 fathoms of water.

Penæidæ.

The genera in this family are laterally compressed; furnished with a long rostrum. Gills dendrobranchiate, branches filamentous. Eyes well developed. First pair of antennæ biramose, furnished with a *protarsema* on the inner side, and a *stylocerite* on the outer. Mandible having a two-jointed *synaphipod*. First three pairs of pereopoda subequally chelate. Carpus long, &c.

First pair of pleopoda single-branched, and in the male furnished with a *petasma*.

PENÆUS, Fabricius.

Body compressed. Rostrum carinate. Ophthalmopod bi-articulate. First pair of antennæ having the dorsal surface deeply excavated to receive the eye, and furnished on the inner

side with a fixed inarticulate branch or *protarsema*, and on the outer with a sharp spine or *stylocerite*. The flagella are never longer than the carapace; and the second pair of antennæ carry a long *scaphocerite*. The pereopoda have the first three pairs subequally chelate, with the hand not broader than the carpus, each increasing in length posteriorly. Posterior two pairs are simple, and all carry a basephysis or branch attached to the basis joint. The pleopoda gradually decrease in length posteriorly; and the branchiæ are arranged as follows:—

Pleurobranchiæ	1	1	1	1	1	1
Arthrobranchiæ	2	2	2	2	2	1
Podobranchiæ .....	.	.	.	.	.	.
Mastibranchiæ	1	1	1	1	1	1
	<i>h</i>	<i>i</i>	<i>k</i>	<i>l</i>	<i>m</i>	<i>n</i>

Penæus caramote (Risso).

This species is described by Milne-Edwards as being armed with a dozen teeth on the upper margin of the rostrum and one on the lower, situated a little in advance of the eyes; whereas the figure which represents it in plate xxv. fig. 1 has only seven teeth on the upper margin of the rostrum and three on the lower, which is incorrect. The figure is reduced to about one third of the natural size.

On each side of the central dorsal crest a deep furrow extends from the anterior margin to close to the posterior, terminating before reaching it; and a third longitudinal groove, less deep but more elevated, separates these two in the posterior half of the carapace, and continues from the posterior margin to the base of the rostrum. A very short tooth is situated on the anterior border of the carapace just above the base of the first pair of antennæ. The eyes are very large and short. The terminal filaments of the first pair of antennæ are extremely short, being shorter than the last two joints of the peduncle. Basis of the three anterior pairs of legs armed with strong teeth. Telson armed on each side with three spines, of which the middle is the strongest.

Length about 7 inches.

Inhabits the Mediterranean.

Penæus canaliculatus (Olivier).

Is extremely like *P. caramote*, but is distinguishable by the rostrum being less elevated towards the base and more ciliated upon the superior border, by the absence of a tooth from the base of the third pair of legs and of spines from the telson.

Length about 5 inches.

Taken at the Celebes and the Isle of France.

Independent of the above differential description of Milne-Edwards, it may be observed that this species has only nine teeth on the upper margin of the rostrum, while *P. caramote* has twelve; that the deep channel on each side of the dorsal carina has the margins parallel, whereas in *P. caramote* the line is waved and the channels broader posteriorly.

The specimen taken as the type by Milne-Edwards in the collection that I examined was labelled from the island of Mauritius.

There are specimens in the 'Challenger' collection from the Fiji Islands and Port Jackson that correspond closely in their general aspect with the typical form. They are, however, smaller in size, and vary somewhat in the aspect of the ventral plate of the female. In Japan a larger form is known, specimens of which are in the British Museum as well as in the Jardin des Plantes; but these, like those in the 'Challenger' collection, are females, and carry a pair of large fan-like membranous processes issuing from the anterior extremity of the ventral plate, the object of which I have not been enabled to determine; neither have I been able to procure or see a male specimen corresponding with this variety. Should it not be the same, I propose to call it *P. japonicus*.

Peneus brasiliensis, Latreille.

There was no specimen of this species in the collection when M. Milne-Edwards wrote, he having taken his information from Latreille. Milne-Edwards distinguishes it from *P. canaliculatus* by the presence of three teeth on the inferior margin of the rostrum. Mr. Miers, in his "Notes on the Penæidæ" (P. Z. S. 1878, p. 306), says that there are two spines on the first pair of pereopoda and one on the second, and that the telson has no marginal spines.

Inhabits the Atlantic, off Brazil.

Peneus velutinus, Dana.

This species, as described and figured in the United States' Exploring Expedition, is covered throughout with a very short velvety coat. Rostrum straight, lanceolate, somewhat ascending from the base, dentate to the apex; seven teeth equidistant, and one posterior; lower margin entire, straight, ciliate. Dorsal surface not carinated or sulcate posterior to the rostral crest. Second and third pairs of pereopoda subequal. Telson armed with minute spinules on either side.

Length $1\frac{3}{4}$ inch.

The habitat of the type is the Sandwich Islands.

Specimens in the 'Challenger' collection from various localities in the Australasian archipelago correspond closely with Dana's description and figure, and, I have no doubt, are the same species, but are generally about twice as large. They may readily be distinguished from closely approximating forms by the petasma on the left ventral side of the male being longer than that on the right, and by the form of the ventral plates between the coxæ of the two posterior pairs of pereopoda of the female (which is too complicated to be followed in a verbal description, but which will be illustrated in the memoir on the subject in the 'Challenger' reports), and two long ventral teeth between the second pair of pereopoda.

Penæus setiferus, L. (Pl. XI. fig. 1.)

The specimen of this species in the collection of the Museum of the Jardin des Plantes is a male animal, and is the type of Milne-Edwards's description. It has the rostrum as long as the scaphocerite, straight and styliform at the extremity, and armed with two teeth on the lower and nine or ten on the upper margin, which is prolonged posteriorly in the form of a slight crest to half the distance between the frontal and the posterior margins of the carapace; and on each side of the rostrum a small ridge reaches nearly to the stomachic region. There is no little tooth above the ophthalmopod, which is long and supports a large eye. The antennal filaments are about half the length of the peduncle which carries them. The flagellum of the second pair of antennæ is excessively long; and there are no spines on the lateral margin of the telson.

Length about 7 inches.

It is often found in very considerable numbers at the embouchures of the rivers of Florida. That in the collection is labelled "Guadaloupe."

An examination of this species shows that the outer flagellum of the first pair of antennæ has the small articuli obliquely arranged, and the upper margin of each produced into a sharp posteriorly directed tooth. I have not seen this structure in any other species, and I believe it is a sexual character only.

The petasma attached to the first pair of pleopoda is longitudinally folded as a double tube.

Telson dorsally grooved longitudinally, and terminating in a sharp point; lateral margins without spines, but thickly furred with hair.

Milne-Edwards has grouped this species among those that have no groove in the median line between the base of the rostrum and the posterior margin of the carapace. This is by no means a definite character of specific value, inasmuch

as it exists in some species in the female and not in the male.

Peneus monoceros, Fabricius.
(Pl. XI. fig. 2.)

Rostrum straight and ciliated on the lower margin; from the point the crest is a little elevated posteriorly, and armed with nine teeth, of which the posterior is a little more distant than the rest, and situated near the centre of the stomachic region. The terminal flagella of the first pair of antennæ are short, being less long than the last two joints of the peduncle. Legs short; and there are no spines on the margins of the telson.

Length about 3 inches.

Inhabits the coasts of India.

The typical specimen is labelled from Bombay. It is a female, and offers no decided character in the arrangement of the posterior ventral plates of the pereion, from which I presume that it is not a fully adult-formed specimen. Dana figures the cephalon of a specimen from Singapore(?) about 5 inches in length; but it appears to differ little, in the parts that he has figured, from his own species *P. velutinus*, excepting that in the latter the rostrum is pointed a little upwards instead of horizontally straight as in the type of *P. monoceros*, which differs from the specimen above described only in having a few spines on each side of the telson.

Peneus indicus, M.-Edw. (Pl. XII. fig. 5.)

The rostrum is described by the author as being straight, styliform at the extremity, reaching beyond the distal extremity of the peduncle of the first pair of antennæ, and surmounted posteriorly by a crest which continues nearly to the third part of the carapace. Eight or nine teeth surmount the dorsal margin; and four or five are situated on the lower. The flagella of the first pair of antennæ are slender and are a little longer than the peduncle of the same. In general characters this description resembles *P. setiferus*.

Length about 6 inches.

It inhabits the coast of Coromandel.

The typical specimen is labelled from the coast of Coromandel, and is a female. It is described as having the "rostre droit," whereas the specimen has the extremity of the rostrum slightly elevated. In all other parts the description faithfully agrees with the specimen.

So closely does this species coincide with the figure given by Heller of his *P. tahitensis* ('Reise der Fregatte Novara,')

p. 121) that I think they are the same; unfortunately Heller describes the inferior margin of the rostrum as being "edentulous," whereas his figure 2, plate xi., shows there are three teeth on the lower margin.

Penæus carinatus, Dana, also, it appears to me, belongs to this species, the only distinction being that Dana and Heller's species have three teeth on the lower margin, and the type of *P. indicus* has four or five; but these are not distinctly portrayed, and are more elevations than distinct teeth.

Undoubtedly the number of teeth on the rostrum is a very constant feature in normal and well developed forms, and may be relied upon as representing some important structural character in the animal. Occasionally, however, some forms exhibit an effort to abnormally increase or diminish the number; but whenever this is the case the teeth exhibit generally an imperfect and enfeebled condition. This appears to be the case with the type specimen; and I am induced to think that they are merely varieties of the following species.

There are other specimens in the collection labelled "*P. indicus*," some of them from the coast of Coromandel; but these bear the impress of having been named by others than the veteran author of the 'Histoire des Crustacés;' they agree more nearly with *Penæus setiferus* of the West Indies, and require a closer examination than I devoted to determine them specifically.

Penæus monodon, Fabricius.

This species is extremely like *P. indicus*; but, according to Milne-Edwards's definition, the rostrum only presents three teeth on the lower margin, and the flagella of the first pair of antennæ are shorter.

Length of types of Milne-Edwards 3 inches; of Fabricius 7 inches.

Hab. Indian seas.

The type specimens are all small and immature animals; but there are larger specimens in the collection that agree with Fabricius's description as referred to by Edwards. A close analysis of this species compared with *P. indicus* makes me very dubious of any truly specific character, beyond the "much shorter length of the flagella of the first pair of antennæ," and there being only three teeth on the lower margin of the rostrum.

I am induced, from the great resemblance in the form of the ventral plates in the females, to accept the conclusion that *P. indicus*, Edw., *P. monodon*, Fabricius, *P. semisulcatus*,

De Haan, *P. tahitensis*, Heller, *P. carinatus*, Dana, and *P. esculentus*, Haswell, are varieties of this species (*P. monodon*).

The ventral plate, which varies considerably in form in the females of most species, consists in this of two halves of a circular disk, the straight side being longitudinally in the median line, the margins of which are curved upwards (Pl. XII. fig. 5, *v p*).

The petasma in the male consists of a longitudinal tube formed by the two plates being united together along the anterior surface, whereas it is open posteriorly. I have only had the opportunity of examining male specimens of those in the 'Challenger' collection.

The type specimens of the males of *P. indicus* and those of *P. monodon* in the collection of the Jardin des Plantes were too small for the full development of the parts.

Peneus affinis, Milne-Edwards.
(Pl. XII. fig. 6.)

This species resembles *P. indicus*, from which it may readily be distinguished by the absence of teeth upon the inferior border of the rostrum, the shortness of the eyes (which scarcely pass the external margin of the scaphocerite), and the form of the dactylus on the posterior two pairs of pereopoda, which are extremely slender and not sensibly flattened.

Length about 5 inches.

Inhabits the coast of Malabar.

There were several specimens in the same bottle, labelled from Malabar; and they evidently show that Milne-Edwards drew up his description from a female, with which it coincides; but among them were also several males, and these differed from the others in essential features; so that, had they not been found associated, I should have considered them typical forms of distinct species.

The male has a peculiar notch or excavation on the anterior margin of the ischium of the fifth pair of pereopoda (Pl. XII. fig. 6, *o*); surmounting the notch is a slight prominence or tubercle. Another notch or excavation surmounted by a distal prominence is situated at the base on the outer margin of the external plate of the rhipidura (Pl. XII. fig. 6, *v*); in both sexes the telson is dorsally grooved, and terminates in a long and slender style-like extremity.

The ventral plate of the female is heart-shaped and depressed in the centre; and the petasma in the male terminates in a cross piece that will be better appreciated from examination than from any description.

In a second bottle, labelled "India," is a single female

specimen that I take to be *P. sculptilis*, Heller. It resembles *P. affinis* in every detailed appearance, except that it has posterior to the rostral crest a carina flattened at the summit, with traces of a longitudinal groove in the median line, and, moreover, it has two fine sutures resembling fractures on each side of the carapace. One, the longer, commences just above the orbital tooth on the frontal margin, and traverses the surface of the carapace longitudinally in a waved line to near the posterior margin; the other is at the infero-lateral margin of the carapace, near the centre of the branchial region. There is also a small suture on the infero-lateral margin of the first somite of the pleon; but all these I have observed as a condition in other species.

The *Peneus monoceros* (*ensis*) of De Haan is undoubtedly, I think, a female specimen of *P. affinis*.

P. affinis (*barbatus*) of De Haan I consider to be *P. velutinus* of Dana.

P. Hardwickii of Miers differs from *P. affinis* in having the tooth over the gastric region apparently broken, and the apex of the rostrum a little more curved upwards.

Peneus fissurus, n. sp.

Like *P. monoceros*, but has only six teeth on the rostrum and one on the gastric region. Pleon carinated from the posterior portion of the third somite. Fourth, fifth, and sixth somites produced to a small dorsal tooth at the posterior margin in the median line. Telson armed with a strong tooth on each side.

Taken at a depth of 50 fathoms south of New Guinea.

There are three remarkable fissures that I have observed in other species also traversing the carapace from the orbital to near the posterior margin, and from the lateral margin of the carapace vertically across the branchial region on each side.

Peneus rectacutus, n. sp.

Rostrum horizontal, straight and sharp, armed on the upper surface with eleven or twelve teeth and one on the gastric region. Lower margin straight and fringed with cilia. Dorsal surface of the pleon carinated on the fourth, fifth, and sixth somites, which last terminates in a posterior tooth.

Taken in about 100 fathoms of water among the Philippine Islands.

Peneus brevicornis, Milne-Edwards. (Pl. XI. fig 3.)

Rostrum very short, scarcely passing the eyes, elevated to a crest near the base, styliform, armed with six teeth on the

upper and smooth and straight on the lower margin. Flagella of the first pair of antennæ slender and short, about half the length of the peduncle.

Length about 3 inches.

Inhabits the coasts of India. Taken off Madras by Sir Walter Elliot.

The specimens in the Museum are labelled "Bombay." The female does not exhibit any distinctly formed ventral plate, from which I presume that it has not attained its full development. The male has the petasma approximating that of *P. affinis*, yet with characters sufficiently distinguishable to determine the species.

Pencæus avirostris, Dana (United States' Exploring Expedition, p. 603), belongs, I think, to this species. It appears to be a full-grown specimen.

Length 5 inches.

It inhabits the coast near Singapore.

Pencæus Philippii, n. sp.

Rostrum horizontal and straight in the male; slightly depressed over the distal extremity of the eye and again raised in the female; six or seven teeth on the upper surface of the rostrum, and one on the gastric region. Eye large, ovate, half the length of the rostrum. First pair of antennæ with the peduncle not longer than the rostrum. Flagella about half the length of the peduncle. Telson furnished with three spines on the lateral margin. Male having the petasma folded, long and narrow, somewhat like *P. velutinus*, but has the plate on the left side, which is the longer of the two, rolled over anteriorly. The female has the ventral plate longitudinally divided and bilobed.

This species was taken off the Philippine Islands in about 100 fathoms of water. I have dedicated it to Philippi, who has written of the family; hence the specific name.

Pencæus anchoralis, n. sp.

Rostrum horizontal on the upper margin; eight teeth on the rostrum and one distant on the gastric region. Lower margin smooth and gradually ascending in a curved line to the apex. The frontal margin is armed with a small supraorbital, and with antennal and hepatic teeth. The third, fourth, and fifth somites terminate in a small dorsal carinate tooth. Telson unarmed; but a small notch looks as if, in unworn specimens, a small spine might exist on each side.

Length $3\frac{1}{2}$ inches.

Taken south of New Guinea in 28 fathoms of water.

In the male the species may readily be recognized by the petasma being folded in a form much resembling that of an anchor, of which the flukes fall laterally over the basal joint of the two posterior pairs of pereiopoda. In the female the ventral plate (of a somewhat hexagonal form) lies between the base of the penultimate pair of pereiopoda, behind which a cup-like depression exists.

Penæus telsodecacanthus, n. sp.

Carapace with five teeth on the rostrum and one distant on the gastric region. Sixth somite of the pleon produced to a small dorsal carinate tooth. Eye large. Telson long, pointed, armed on each side with five articulating spines.

Length 3 inches.

Taken in the channels of the Japanese islands in from 8 to 10 fathoms of water.

Penæus serratus, n. sp.

Rostrum slightly arched, serrated with twelve or more small teeth between the apex and the frontal margin, and one more conspicuous on the gastric region. Lower margin ciliated, each hair having a defined point of attachment. Telson long, narrow, and pointed, laterally armed near the distal extremity with a rigid tooth on each side.

Length about 4 inches.

Taken off the Fiji Islands in about 300 fathoms of water.

The specimens of this species are much damaged: the flagella of the first pair of antennæ are not perfect; but they appear to be slender and not longer than the peduncle. In other respects this species closely resembles that which M. A. Milne-Edwards has named *Penæopsis serratus*, from a specimen taken in the Gulf of Mexico, but which has the flagella of the first pair of antennæ longer than the carapace, for which he proposes to make a new genus, *Penæopsis*. I have not yet met with any specimens in the collection of the 'Challenger' corresponding with this definition, that do not belong to the genus *Solenocera* of Lucas; so that I have not had an opportunity of examining the branchial apparatus to feel quite certain that the genus is a good determination; I have therefore used the same specific name, to show their close approximation of form.

Genus *PENÆOPSIS*, A. Milne-Edwards, MS.

Like *Penæus*, but with the flagella of the first pair of antennæ longer than the carapace and cylindrical.

This genus is proposed by M. Alphonse Milne-Edwards for those *Penæi* which do not belong to *Solenocera*. It is founded on a species not yet described that he has seen in the collection of the U.S. Mexican-Gulf exploration, but which so closely corresponds with *Penæus serratus* from the Fiji Islands, that, if they are not separated by the length of their antennæ, they appear to be identical; and I have accordingly adopted the same specific name.

Penæopsis serratus, A. Milne-Edwards, MS.

Length about 4 inches.

Taken in the Gulf of Mexico.

The gradual approximation of the length of the flagella of the first pair of antennæ, as seen in specimens of *Penæus caramote* on the one hand, where they are so short as to be easily overlooked, to that of *Penæopsis*, where they are half the length of the animal, is so gradual that it is difficult, however convenient it may be, to determine where the genus can naturally be separated; and without any other distinguishing feature it can only be accepted as provisional.

Penæopsis styliferus, Edwards.

The type of this species appears not to be preserved; or at least we could not identify it. M.-Edwards says that the filaments of the first pair of antennæ are cylindrical; it therefore cannot, like the other two species arranged by M.-Edwards in his second division of the genus *Penæus*, belong to the genus *Solenocera*.

Length 4 inches.

Taken in the neighbourhood of Bombay.

Penæus Dobsoni, Miers (Proc. Zool. Soc. March 5, 1878), appears to differ from *P. styliferus* only in the slightly different length of the flagella of the first pair of antennæ; and, with the exception of the peculiar feature of the fifth pair of pereopoda (which the author considers to be a condition of the female, and which appears to be abnormal), I see nothing to separate this species from *P. styliferus* as described by Edwards.

Hab. West coast of India.

Genus SOLENOCERA, Lucas.

Milne-Edwards separated the genus *Penæus* into two divisions, the second of which contained "those having the terminal flagella of the first pair of antennæ longer than the carapace," and established in it three species—*P. membranaceus*, *P. crassicornis*, and *P. styliferus*.

The last of these three species I was not able, with the assistance of the accomplished curator, M. A. Milne-Edwards, to find, the label probably having been lost in the hasty removal of the specimens during the unhappy siege and communistic occupation of Paris.

The first two belong to the present genus, established by M. Lucas ('Annales Soc. Entomologique de France,' Février 1849, p. 215, pl. vii. no. 11) on *Penæus siphonoceros* of Philippi (Archiv für Naturgesch. p. 190, pl. iv. fig. 3, 1840), which he named *Solenocera Philippii*, from a specimen that he captured off the coast of Algiers.

Solenocera differs from *Penæus* in having the flagella of the first pair of antennæ not only longer than the carapace, but having one branch broader than the other and hollow on the inner side, so that the less robust flagellum may rest longitudinally in the larger, and by having four teeth on each side of the carapace, one at the outer orbital angle, one supra-orbital, one hepatic, and one near the antero-inferior angle of the carapace.

The branchiæ also differ from those of *Penæus* in having two arthrobranchial plumes attached to the penultimate pair of pereopoda, and one arthrobranchial and one podobranchial plume attached to the first pair of gnathopoda, and may be tabulated as follows:—

Pleurobranchia .....	.	1	1	1	1	1	1
Arthrobranchiæ.....	1	2	2	2	2	2	.
Podobranchia.....	1	.	.	.	.	.	.
Mastibranchia	1	1	1	1	1	1	.
		<i>h</i>	<i>i</i>	<i>k</i>	<i>l</i>	<i>m</i>	<i>n</i> <i>o</i>

Solenocera membranacea, Fabr.

Milne-Edwards describes this species as being carinate for the entire length of the carapace. The extremity of the rostrum is a little turned upwards, and is very short, not extending beyond the eyes, with five or six teeth on the upper surface, and ciliated on the lower. Eye large and short, the flagella of the first pair of antennæ being much longer than the carapace, one slender and cylindrical, the other broad, flat, and ciliated on the inner side. Telson long and styliform, grooved on the upper surface, the margins of which terminate on each side in a sharp-pointed tooth.

Length about 3 inches.

Inhabits the Mediterranean.

Solenocera Philippii, Lucas, appears to me to be the same species; but, according to the author's figure, the extremity of the larger flagellum of the first pair of antennæ terminates

more abruptly than it appears to do either in *S. membranacea* or the specimen preserved as the type of Lucas's species.

Solenocera crassicornis, Milne-Edwards.

The specimen is labelled "Bombay," and corresponds with the author's description, to which may be added the presence of four teeth that are to be found on the anterior extremity of the carapace, and are of generic value.

There are specimens from the sea between Borneo and the Philippine Islands, taken at 250 fathoms, in the 'Challenger' collection; and Sir Walter Elliot has taken it at Waltair, on the Madras shore of India.

Solenocera Lucasii, n. sp.

Rostrum short and with seven teeth, of which the last two are more distant and situated above the gastric region. Eye not large; larger branch of flagella of first pair of antennæ tapering; posterior pair of pereiopoda long; dactylus compressed. Telson shorter than the inner plates of the rhipidura.

Length 3 inches.

Taken south of New Guinea at about 130 fathoms.

HALIPORUS, n. gen.

General appearance more slender than *Solenocera*, appendages longer and more slight. Second pair of gnathopoda as long as and stouter than the pereiopoda. Flagella of the first pair of antennæ long, subequal, cylindrical. Telson long and narrow, laterally compressed.

Haliporus curvirostris, n. sp.

Carapace covered with minute spines; dorsal median line dentate. Rostrum curved, being posteriorly and anteriorly depressed. Telson armed with two or three small teeth at the sides.

Length about 3 inches.

Taken in mid Pacific at 2375 fathoms.

Haliporus lævis, n. sp.

Having no lateral teeth on the carapace, six teeth on the rostrum, and two on the gastric region. Rostrum straight.

Length about 2 inches.

Taken in mid Atlantic at a depth of 2500 fathoms.

Haliporus neptunus, n. sp.

Carapace smooth. Rostrum armed with six teeth, and two

on the gastric region. Petasma folded so as to resemble two tridents, one on each side.

Length 3 inches (male).

Taken among the Celebes Islands in about 600 fathoms of water.

Haliporus obliquirostris, n. sp.

Rostrum elevated from the base obliquely upwards, armed with five teeth, and two larger ones on the gastric region. Telson sharp, as long as the plates of the rhipidura, and armed with two immovable teeth, one on each side.

Length about 3 inches (female).

Taken off Kermadec Island.

I should have considered these to be the females of *H. neptunus*, but for the separation of their habitats by so great a distance—no female being found with the former, and no male with the latter.

Genus *HEMIPENÆUS*, n. g.

Rostrum horizontal, shorter, or, at all events, not longer, than the peduncle of the first pair of antennæ. Ophthalmopod single-jointed, furnished with a small tubercle. First pair of antennæ with the flagella unequal, one exceedingly short and implanted near the base of the third joint, the other very long and situated at the extremity. Branchial arrangement as follows:—

Pleurobranchia .....	.	.	1	1	1	1	1	1	= 5
Arthrobranchiæ .....	.	.	2	2	2	2	2	.	= 10
Podobranchia	1	1	1	1	1	.	.	.	= 5
Mastibranchia	1	1	1	1	1	.	.	.	(5)
			<i>h</i>	<i>i</i>	<i>k</i>	<i>l</i>	<i>m</i>	<i>n</i>	<i>o</i>
									20 + (5)

Hemipenæus spinidorsalis, n. sp.

Rostrum straight, sharp, styliform, armed with two teeth on the posterior and one on the gastric region, and one long spine-like tooth on the dorsal surface of the third somite of the pleon directed backwards. Appendages long and slender.

Length about 3 inches.

Taken in the South Atlantic, near the island of Tristan d'Acunha, in 1900 fathoms of water.

Hemipenæus speciosus, n. sp.

Rostrum anteriorly depressed, armed with three teeth on the upper surface, one of which is posterior to the frontal margin, the other two near together on the rostrum. Ophthalmopod long and slender. Eye scarcely larger than the

diameter of the stalk. Pleon unarmed, sixth somite terminating posteriorly in an angle.

Length about $2\frac{1}{2}$ inches.

Taken in the Atlantic off the coast of South America, at a depth of 2650 fathoms.

Hemipencæus virilis, n. sp. *Aristeus*

Rostrum straight, armed with three teeth, posterior small and distant. Carapace smooth. Pleon having the posterior margin of the fourth and fifth somites produced in the median line to a small tooth. Ophthalmopod short. Eye large, orbicular.

Length about 4 inches (male).

Taken near the Philippine Islands at a depth of 255 fathoms.

Hemipencæus dubius, n. sp.

Rostrum straight, equal in length to the peduncle of the first pair of antennæ, armed on the lower side with four small teeth situated on the distal half, and eight upon the upper, equidistant from each other, between the apex and the gastric region. Dorsal surface elevated to a crest above the line of the frontal margin. Pleon smooth, sixth somite terminating in a small tooth posteriorly projected. Eyes large.

Length about 3 inches (male).

Taken among the Philippine Islands at a depth of less than 20 fathoms of water.

Genus *ARISTEUS*, Duvernoy.

This genus was established by M. Duvernoy in the *Annales des Sc. Nat.* for 1841, vol. xv., from a specimen taken in the Mediterranean which Risso had previously named *Pencæus antennatus*, under the mistaken supposition that the structure of the branchiæ was essentially different from that of *Pencæus*. But although the structure is the same, as pointed out by Dana and confirmed by Mr. Miers, the arrangement of the branchial plumes is essentially distinct, as may be seen if the following Table be compared with that of *Pencæus*.

Pleurobranchia	1	1	1	1	1	1	1	= 7
Arthrobranchiæ	1	2	2	2	2	2	.	= 11
Podobranchia	1	1	1	1	1	.	.	= 5
Mastibranchia	1	1	1	1	1	1	.	= 6
	<i>h</i>	<i>i</i>	<i>k</i>	<i>l</i>	<i>m</i>	<i>n</i>	<i>o</i>	$\frac{23 + (6)}{29}$

If this Table be compared with that of *Pencæus*, it will be found that there are podobranchial plumes attached to the five anterior appendages of the pereion (that is, to the two pairs

of gnathopoda and the three anterior pairs of pereopoda), whereas in *Penæus* there are none; and if comparison be made with Duvernoy's figure of the branchial arrangement, it will be seen that he represents no mastibranchial lash attached to the penultimate pair of pereopoda, whereas the specimens that have come under my examination in the 'Challenger' collection show that there is a large mastibranchial plate. In discussing this point with M. A. Milne-Edwards, he contended that the presence or absence of an appendage such as this, unless it were corroborated by some external evidence, was a very doubtful specific character, and one that was of no value in the history of descent when not otherwise illustrated.

Still it appears to me that a feature relating to the economy of the animal of so important a character, if constant, must be of specific value; so that its generic connexion must depend upon its constant character in allied specific forms. If on further examination I am enabled to determine a series of species in which the mastibranchial lash is constant, however much in other respects they may resemble *Aristeus*, they must, in our present state of knowledge, be arranged as a distinct genus; and as I think this can be done, I propose provisionally the name of *Plesiopenæus* for such as have the mastibranchial plate attached to the penultimate pair of pereopoda, which is not present in the figure given by Duvernoy ("*Crustacés de Nice*," Ann. des Sc. Nat. vol. xv. 1841).

Aristeus antennatus, Risso.

Rostrum styliform, reaching a little beyond the extremity of the peduncle of the first pair of antennæ, and with three strong teeth on the dorsal surface at the base. Pleon smooth, fourth and fifth somites produced to a point on the dorsal surface in the median line, but not elevated or produced into a tooth.

Hab. Mediterranean, at a great depth (*Risso, Duvernoy, Johnson*), Algiers.

Penæus Edwardsianus of Johnson (Proc. Zool. Soc. 1867, p. 897) undoubtedly belongs to the same species.

Aristeus armatus, n. sp. *P. armatus*

Rostrum styliform, as long again as the peduncle of the first pair of antennæ. Three long teeth near together above the frontal margin. Third, fourth, and fifth somites of the pleon dorsally produced into a laterally compressed tooth; sixth somite carinate. Telson armed on each lateral margin with four small spines. Ophthalmopod long. Eye not large.

Flagella of second pair of antennæ twice the length of the animal.

Length 8 inches.

Taken among the islands of the Australasian archipelago, in the North Pacific, and South Atlantic, at a depth of from 1900 to 2050 fathoms.

Aristeus semidentatus, n. sp.

Rostrum styliform, straight, armed on the upper margin with two teeth near together in front, and one further behind the frontal margin. Posterior dorsal margin of the fourth, fifth, and sixth somites produced to a small tooth. Eye orbicular. Ophthalmopod slender.

Length $3\frac{1}{2}$ inches (female).

Taken south of the Philippine Islands.

Aristeus tomentosus, n. sp. ♀ of *A. virilis*

Surface covered with a short fur. Rostrum scarcely as long as the peduncle, armed with three short distal teeth. Pleon having a small tooth at the posterior dorsal margin of the fourth, fifth, and sixth somites. Eye large, orbicular.

Length 6 inches (female).

Taken south of the Philippine Islands.

Aristeus rostridentatus, n. sp. Pleon ~~new~~

Rostrum long, elevated, curved, armed on the upper margin with ten or twelve teeth, the posterior of which is situated on the gastric region. Third and following somites of the pleon furnished with a small tooth at the posterior dorsal margin. Ophthalmopod short. Eye orbicular, on a slender ophthalmopod. Flagellum of second pair of antennæ about six times the length of the animal.

Length about 6 inches.

Taken near the Fiji Islands at a depth of about 300 fathoms.

Genus HEPOMADUS, n. g.

There are only two specimens of this genus; they are of distinct species; and both are injured. The rostrum of each is broken; but the larger specimen has a slender tooth on the dorsal surface just behind the frontal margin. But the structure of the branchiæ differs from that of either *Pencœus* or *Aristeus* in having the ultimate branches longer and in having the mastibranchial lash of the penultimate pair of pereopoda rudimentary, in having only four podobranchial plumes, and in having all the pleurobranchiæ small except the posterior, as shown in the accompanying Table.

Pleurobranchia	1	1	1	1	1	1	1
Arthrobranchiæ.....	1	2	2	2	2	2	.
Podobranchia.....	1	1	1	1	.	.	.
Mastibranchia	1	1	1	1	1	.	.
	<i>h</i>	<i>i</i>	<i>k</i>	<i>l</i>	<i>m</i>	<i>n</i>	<i>o</i>

Hepomadus glacialis, n. sp.

Dorsal surface of the carapace elevated into a carina that terminates at the cardiac region. Pleon armed with one large tooth at the dorsal median posterior margin on the third somite, and one little one on the fourth and fifth. Ophthalmopod long, furnished with a small tubercle near the base on the inner side. Eye small, not much larger than the diameter of the stalk.

Length about 8 inches (female).

Taken in mid South Atlantic at a depth of 1875 fathoms.

Hepomadus inermis, n. sp.

Dorsal surface unarmed. Pleon smooth. Telson not half the length of the outer plate of the rhipidura. Rostrum (broken off).

Length about 4 inches.

Taken in middle of South Pacific at a depth of 2550 fathoms.

Genus BENTHESICYMUS, n. g.

Structure of the integument submembranous. Rostrum short, compressed, crested. Ophthalmopod flattened, furnished with a conspicuous tubercle or secondary eye. Eye not large. First pair of antennæ with the flagella subequally long, the upper more robust than the lower, not longer than the carapace. Mandible carrying a two-jointed appendage, second joint short and pointed. Second pair of gnathopoda terminating in a sharp-pointed dactylus. Pereiopoda long, slender, feeble. Branchiæ with the ultimate branches longer than in *Pencœus*, and arranged as in the following Table:—

Pleurobranchia .....	.	1	1	1	1	1	1
Arthrobranchiæ.....	2	2	2	2	2	2	.
Podobranchia.....	1	1	1	1	1	.	.
Mastibranchia	1	1	1	1	1	1	.
		<i>h</i>	<i>i</i>	<i>k</i>	<i>l</i>	<i>m</i>	<i>n</i>
							<i>o</i>

Benthesicymus crenatus, n. sp.

Rostrum straight, pointed, dorsally elevated into a laterally compressed crest, armed with three small teeth, and one behind the crest on the gastric region. Cervical suture deeply fissured. Posterior margin of the fourth somite of the

pereiopod crenated, fifth produced to a small tooth in the dorsal median line. Pleopoda very long.

Length 8 inches (female).

Taken in mid Pacific at a depth of 2600 fathoms.

Benthesicymus altus, n. sp.

Rostrum pointed, crest armed with two teeth. Dorsal surface smooth. Ophthalmopod as long as the rostrum. Eye small. Flagella of first pair of antennæ half as long as the animal.

Length about 3 inches.

Taken several times between Australia and Japan, between 350 and 1400 fathoms.

Benthesicymus brasiliensis, n. sp.

Rostrum pointed, crest armed with two small points. Third somite of the pleon dorsally terminating in the median line with a small laterally compressed tooth; fourth and fifth somites carinate and terminating in a smaller tooth; sixth carinate. Telson long and narrow, but not so long as the lateral plates of the rhipidura.

Length about 5 inches.

Taken several times in the Atlantic and Pacific oceans, the finest specimens occurring off Brazil at 1100 to 2440 fathoms.

Benthesicymus iridescens, n. sp.

Rostrum short, not more than half the length of the ophthalmopod; crest armed with one small tooth.

Length about 4 inches.

Taken in South Atlantic, near the island of Tristan d'Acunha, in 1900 fathoms of water.

Genus GENNADAS, n. g.

Like *Benthesicymus*, but much smaller; peduncle of the first pair of antennæ longer and stouter; the dactylus of the second pair of gnathopoda is spatuliform, instead of being cylindrical and sharp; and the first pair of pereiopoda is shorter and, compared with the others, more robust. The structure of the branchiæ is also modified.

This genus approximates nearer than any other to the little crustacean named *Penæus* (*Kolga*) *speciosus* in Salter and Woodward's map of fossil Crustacea; hence the generic name (from γεννάδας, of a noble race).

Gennadas parvus, n. sp.

Rostrum short, pointed; crest armed with one tooth, and behind the crest a little point. Ophthalmopod short. Pereiopoda slender. Pleopoda long. Telson short.

Length scarcely 1 inch (male).

Taken off Japan in 2425 fathoms.

This small species is undoubtedly an adult male; for the petasma attached to the first pair of pleopoda is large and well developed, while two button-like plates, larger than are found in animals of much greater size, are attached to the second pair of pleopoda. These are seen only in well matured males.

It has been taken frequently in both Pacific and Atlantic oceans, in from 1240 to 2550 fathoms, and once in the deep trawl-net in the Pacific.

Genus EUPHEMA, Edwards.

There is a specimen in the 'Challenger' collection which belongs to this genus; but I think that it is only a very young and immature form of some species of *Penæus*. It corresponds nearly with the figure of the fourth stage in the development of *Palæmonetes vulgaris* as given by Mr. Walter Faxon in his plates on the development of the latter species in vol. v. no. 15 of the 'Bulletin' of the Museum of Comparative Zoology at Harvard College, U. S., 1879, excepting that our specimen has the third pair of pereiopoda chelate. The rostrum is curved upwards, and is not denticulated along the margin. The large tooth upon the dorsal surface of the second somite of the pleon is waved and turned upwards; and the fourth, fifth, and sixth somites terminate posteriorly in a small tooth.

Length little more than $\frac{1}{4}$ inch. Edwards's specimen is 8 lines.

Both were taken in the Atlantic Ocean.

I give our specimen no name, feeling sure that it is a young Penæid, probably of the genus *Aristeus*.

Genus PASIPHÆA.

Neither by the description of M. Milne-Edwards nor the figures of Risso and Savigny can this genus be retained in the group or family of the Penæidæ or allied forms.

If the species in the 'Challenger' collection belong to this genus, as I believe they do, the branchial plumes are deve-

loped on the type of the Phyllobranchiata. On this point also the figures of Michael Sars are insufficient; and he says nothing about the branchiæ in his 'Bidrag til kundskab om Christiania-Fjordens Fauna,' 1868.

Sergestidæ.

The genera in this family yet require more extended research and observation. The specimens in the 'Challenger' collection are numerous, but, coming mostly from deep water, are in a very injured condition. The first pair of pereopoda is not chelate; but the succeeding two pairs are, and the fourth and fifth are simple.

Genus SERGESTES, Edwards.

Has the fifth pair of pereopoda smaller than the fourth, a small leaf-like plate attached to three somites, and the branchiæ arranged as follows:—

Pleurobranchiæ	1	1	1'	1'	1'	2	.
Arthrobranchia .....	.	.	.	.	.	.	.
Podobranchia .....	.	.	.	.	.	.	.
Mastibranchia	1	.	.	.	.	.	.
	<i>h</i>	<i>i</i>	<i>k</i>	<i>l</i>	<i>m</i>	<i>n</i>	<i>o</i>

Sergestes Krøyeri, n. sp.

Like *S. Frisii* of Krøyer, but is about 3 inches long; it is a female, and has the cervical fossa well defined on the dorsal surface. Rostrum a small anteriorly directed crest-like tooth. Ophthalmopod half the length of the first joint of the first pair of antennæ, large, orbicular. First pair of pleopoda long and unbranched, fifth pair short and biramous. Telson as long as the inner plate of the rhipidura.

Length $2\frac{1}{2}$ inches.

Taken off Kermadec Island in about 500 fathoms of water.

This species has two well-developed pleurobranchiæ attached to the penultimate somite of the pereion, two to the antepenultimate, one plume and a leaf-like plate to the next three somites, and one plume and a rudimentary mastibranchial plate to the first pair of gnathopoda.

Sergestes prehensilis, n. sp.

Like the preceding, but has no cervical fossa, and has the rostral crest larger and more sharp. The first pair of pereopoda is shorter than the succeeding, and has an organ for grasping at the last articulation between the ultimate and penultimate joints, such as Krøyer shows to exist in *S. Ed-*

wardsii at the penultimate articulation. Telson shorter than inner branch of rhipidura.

Length about 2 inches.

Taken off Japan in about 500 fathoms of water.

Sergestes japonicus, n. sp.

Like *S. Kröyeri*, female, but has the ophthalmopod nearly as long as the first joint of the first antenna. Eye small.

Length about 3 inches.

Taken south of Japan, in about 350 fathoms.

This species has two pleurobranchial plumes attached to the penultimate somite of the pereion, one and a foliaceous plate to all the preceding, and a rudimentary mastibranchial plate attached to the first pair of gnathopoda.

Sergestes diapontius, n. sp.

Resembles *S. ancyllops* of Kröyer, but differs in the rostrum being not horizontal, but directed upwards and forwards. Telson as long as the outer plate of the rhipidura. Ophthalmopod as long as the first two joints of the first antenna. Eyes round. One of the flagella of the first pair is half as long as the animal, and twice the length of the peduncle. It differs from *S. brachyorrhos*, Kröyer, in having the lateral margin of each somite of the pleon terminating in a sharp tooth, and in the length of the telson.

Length 1 inch.

Taken in towing-net in the Atlantic.

Genus PETALIDIUM (*πεταλίδιον*, a small leaf).

This genus is very imperfectly known to me, owing to the damaged condition of the specimen. As far as I know it externally corresponds with *Sergestes*; but the structure and arrangement of the branchiæ are different. The structure can only be described by figures; but the arrangement is as in the following Table:—

Pleurobranchia .....	. 1'	1'	1'	1'	. .
Arthrobranchia .....	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Podobranchia .....	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Mastibranchia .....	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
	<i>h</i>	<i>i</i>	<i>k</i>	<i>l</i>	<i>m</i> <i>n</i> <i>o</i>

Between the somites of the pereion corresponding with each branchial plume is an interstitial foliaceous leaf; hence the generic name.

Petalidium foliaceum.

Cervical suture well defined. Rostrum elevated into a

crest that has one distinct rostral tooth and posteriorly a rudimentary point.

Length about 3 inches.

Taken in South Indian Ocean at a depth of about 2100 fathoms.

Genus ACETES, Edwards.

I have not had the advantage of examining critically any species of this genus; but it appears to differ from *Sergestes* in the absence of the two posterior pairs of pereopoda; but whether the third and fourth pairs terminate in minute chelæ, as in *Sergestes*, I am not able to determine. Milne-Edwards has figured and described them, as he has those of *Sergestes*, as being filiform, which they appear to be by the assistance of an ordinary lens; but more critical examination shows that they are minutely chelate, as determined by Kröyer.

The branchial apparatus, so far as I am aware, has not been examined by any one.

Acetes indicus, Edwards.

I am not aware that this animal has been noticed since described by M. Milne-Edwards in 1829 at the Académie des Sciences de Paris; yet it must be very abundant in our seas, and Sir Walter Elliot notes on his collection made at Madras that "a very large *Dicerobalis eroogoodoo* was taken at Waltair in 1825, 21 feet in length and 25 broad. Its stomach was filled with myriads of this little crustacean, which was carried away in basketfuls by the fishermen, and thousands were left scattered on the shore."

Information such as this appears to be suggestive of the desirability of surveying the ocean in mid water as well as at its bottom and surface.

Eucopeiidæ, Dana.

Genus EUCOPIA, Dana.

Gnathopoda developed in the form of true legs. Posterior two pairs of pereopoda "vergiform."

Eucopeia australis, Dana.

Eucopeia australis, Dana, U.S. Expl. Exp. p. 609, pl. xl. fig. 10.

Hab. New Holland. Taken from the stomach of a penguin.

Genus CHALARASPIS, Willemoes-Suhm.

Chalaraspis, Willemoes-Suhm, Trans. Linn. Soc. 2nd ser. Zool. vol. i. p. 37.

This genus approximates closely to *Eucopeia* of Dana, if

it be not identical. The only distinction appears to be in *Eucopia* having the posterior two pairs of pereopoda filiform, whereas *Chalaraspis* has only the posterior pair filiform. But Dana says that his specimen, which was taken from the stomach of a penguin, had the last "four partly broken."

Willemoes-Suhm says "the last pair of pereopods . . . very hairy and without branchiæ. Three branches of branchiæ on the base of the gnathopoda and first four pereopoda, two of which are covered by the carapace." These branchiæ he figures as dendrobranchiate. Dana remarks of his species *Eucopia australis*:—"Branchiæ attached to the base of thoracic legs, irregularly foliaceous, in many folds."

Chalaraspis unguiculata, Willemoes-Suhm.

Length 35-37 millim.

Taken in the South Atlantic in from 350 to 2500 fathoms of water. "Common, with as wide a geographical as bathymetrical distribution."

EXPLANATION OF THE PLATES.

PLATE XI.

- Fig. 1.* *Penæus setiferus*, L., male. *c*, portion of flagellum of first pair of antennæ; *p*, petasma and base of first pair of pleopoda; *T*, telson.
- Fig. 2.* *Penæus monoceros*, Fabricius, female.
- Fig. 3.* *Penæus brevicornis*, Milne-Edwards, male. *p*, petasma and base of first pair of pleopoda.
- Fig. 4.* *p*, petasma and first pair of pleopoda of *Penæus Bocagei*, Johnson, male.

PLATE XII.

- Fig. 5.* *Penæus indicus*, M.-Edwards, female. *v p*, ventral plate.
- Fig. 6.* *Penæus affinis*, M.-Edwards, male. *m, n, o*, third, fourth, and fifth pereopoda; *v*, outer plate of rhipidura.

XX.—*Notes on Longicorn Coleoptera.—Revision of the Ærenicidæ and Amphionychidæ of Tropical America.*
By H. W. BATES, F.R.S., F.L.S.

[Continued from p. 152.]

AMPHIONYCHA.

Amphionycha, Leseleuc in Guérin, Mag. Zool. 1844, t. 138; Lacordaire, Gen. Col. ix. p. 890 (1872).

After the withdrawal of its more aberrant constituents, this genus still remains exceedingly numerous and polymorphic. It comprehends all species of cylindrical or linear form, with



